

JAN 16 2001

JC06 Rec'd PCT/PTO 16 JAN 2001

FORM PTO-1390  
(REV. 10-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

98/07226 WO US

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

Unknown

09/744096

INTERNATIONAL APPLICATION NO.

PCT/EP99/04953

INTERNATIONAL FILING DATE

13 July 1999

PRIORITY DATE CLAIMED

14 July 1998

TITLE OF INVENTION METHOD AND APPARATUS FOR PRODUCING SOUNDS THAT DEPEND  
ON THE OPERATION OF AN INTERNAL COMBUSTION ENGINE IN THE INTERIOR

APPLICANT(S) FOR DO/EO/US

Bernhard Schick

SPACE OF A MOTOR VEHICLE

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 16 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

"Express Mail" Mailing Label Number EL 383 010 267 USDate of Deposit January 16, 2001I hereby certify that this paper or fee is being deposited  
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D.C. 20231.

Hansa de Hernaiz

U.S. APPLICATION NO. (GFI) <b>09/7744096</b>		INTERNATIONAL APPLICATION NO. <b>PCT/EP99/04953</b>		ATTORNEY'S DOCKET NUMBER <b>98/07226</b>	
17. <input checked="" type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):</b> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... <b>\$1000.00</b> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$860.00</b> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... <b>\$710.00</b> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$690.00</b> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$100.00</b> <div style="text-align: right;"><b>ENTER APPROPRIATE BASIC FEE AMOUNT = \$860.00</b></div>				CALCULATIONS PTO USE ONLY	
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	- 20 =		X \$18.00	\$	
Independent claims	- 3 =		X \$80.00	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				<b>\$860.00</b>	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$	
<b>SUBTOTAL =</b>				<b>\$860.00</b>	
Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
<b>TOTAL NATIONAL FEE =</b>				<b>\$860.00</b>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property				\$	
<b>TOTAL FEES ENCLOSED =</b>				<b>\$860.00</b>	
				Amount to be refunded:	\$
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a. <input checked="" type="checkbox"/> A check in the amount of <u>\$860.00</u> to cover the above fees is enclosed.					
b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed.					
c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>02-1653</u> . A duplicate copy of this sheet is enclosed. In the event there is any discrepancy in the amount sent herewith or at any time in the future please charge any additional fee, credit or overpayment to the above deposit account number.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO:  <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <b>ROBERT W. BECKER &amp; ASSOCIATES</b>  <b>11896 N. HIGHWAY 14 SUITE B</b>  <b>TIJERAS, NEW MEXICO 87059</b> </div> <div style="width: 45%; text-align: right;"> <div style="text-align: center;"><i>Robert W. Becker</i></div>         SIGNATURE:   <u>Robert W. Becker</u>          NAME   <u>26,255</u>          REGISTRATION NUMBER       </div> </div>					

09/744096

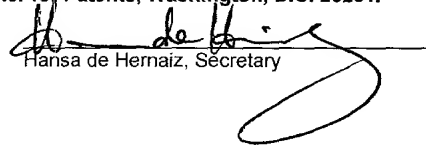
JC02 Rec'd PCT/PTO T 6 JAN 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

  
Hansa de Hernaiz, Secretary

In the Application of Bernhard Schick

Ser. No.: Not Yet Known (based on PCT/EP99/04953 filed July 13, 1999)

First Filed in US: January 16, 2001

For: METHOD AND APPARATUS FOR PRODUCING SOUNDS THAT  
DEPEND ON THE OPERATION OF AN INTERNAL COMBUSTION  
ENGINE IN THE INTERIOR SPACE OF A MOTOR VEHICLE

Assistant Commissioner for Patents

Washington, DC 20231

**PRELIMINARY AMENDMENT ACCOMPANYING ENTRY INTO NATIONAL STAGE**

Sir:

Prior to examination, please amend the above-identified application as follows.

**IN THE SPECIFICATION:**

On page 1, immediately after the title, please insert the following heading:

--Background of the Invention--;

Page 1, between lines 20 and 21, please insert the following heading:

--Summary of the Invention--.

Page 1, lines 21 and 22; delete "in accordance with claim 1 realizes the object of the invention" and insert -- of the present invention provides for detecting fluctuations in pressure in the fresh air stream supplied to the engine, wherein such fluctuations are caused by the intake of the cylinder or cylinders of the engine, by converting such fluctuations into signals,

and by making the signals audible via at least one speaker disposed in the interior space of the motor vehicle - -.

Page 1, line 23, change "claim 2 relates to an", and insert in place thereof - - the - -.

On page 2, line 1, after "invention", please insert - - comprises a pressure sensor for detecting fluctuations in pressure in a fresh air stream to the engine, wherein such fluctuations are caused by an intake of the cylinder or cylinders of the engine, an amplification device for amplifying the output signals of the pressure sensor, and at least one speaker that is disposed in the interior vehicle space and is connected to the amplification device for reproducing amplified output signals - -.

Page 2, line 3, change "in claims 3 through 12", with - - discussed in detail subsequently - -.

Page 2, between lines 15 and 16, please insert the following heading:

--Brief Description of the Drawings --.

On page 3, between lines 2 and 3, please insert the following heading:

--Description of Preferred Embodiments--.

On page 5, line 17, "component 3", should be changed to - - component 30 - -.

On page 8, line 12, change "[sic]" to - - vehicle equipment - -.

On page 9, after line 20, please insert the following paragraph:

--The specification incorporates by reference the disclosure of German priority document 198 31 576.7 of 14 July 1998 and International priority document PCT/EP99/04953 of 13 July 1999.

The present invention is, of course, in no way restricted to the specific disclosure of the specification and drawings, but also encompasses any modifications within the scope of the appended claims.--

**IN THE CLAIMS:**

Please cancel claims 1 - 12, and replace them with the attached claims 13 - 24.

**REMARKS**

Claims 13 - 24 are pending in the application.

Appropriate headings have been added to the specification and the claims from the literal translation have been replaced by claims drafted in conformity with U.S. Patent practice.

The application in its amended state is believed to be in condition for allowance. However, should the Examiner have any comments or suggestions, or wish to discuss the merits of the application, the undersigned would very much welcome a telephone call in order to be able to expedite placement of the application into condition for allowance.

Respectfully submitted,



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for Applicant(s)

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RWB:els

## WHAT I CLAIM IS:

13. A method for producing, in the interior space of a motor vehicle, sounds that depend upon the operation of an internal combustion engine, said method including the steps of:

5 detecting fluctuations in pressure in the fresh air stream supplied to the engine, wherein said fluctuations are caused by an intake of the cylinder or cylinders of said engine;

converting said fluctuations into signals; and

10 making said signals audible via at least one speaker disposed in said interior vehicle space.

14. An apparatus for producing, in the interior space of a motor vehicle, sounds that depend upon the operation of an internal combustion engine, said apparatus comprising:

15 a pressure sensor for detecting fluctuations in pressure in a fresh air stream to said engine, wherein said fluctuations are caused by an intake of the cylinder or cylinders of said engine;

an amplification device for amplifying output signals of said pressure sensor; and

20 at least one speaker disposed in said interior vehicle space and connected to said amplification device for reproducing amplified output signals.

15. An apparatus according to claim 14, wherein said pressure sensor is arranged in such a way that it detects fluctuations in said fresh air stream upstream of a load controlling member of said internal

combustion engine that is disposed in said fresh air stream.

16. An apparatus according to claim 14, wherein said pressure sensor is a differential pressure sensor.

17. An apparatus according to claim 14, wherein said pressure sensor is a pressure sensor that is sensitive for a frequency range of from 1 Hz to 10 kHz.

18. An apparatus according to claim 14, wherein said amplification device contains a filter device for frequency-selective processing of output signals of said pressure sensor.

19. An apparatus according to claim 18, wherein said filter device attenuates frequencies over 300 Hz.

20. An apparatus according to claim 18, wherein said filter device attenuates frequencies below 30 Hz.

21. An apparatus according to claim 14, wherein a modulation device is provided for altering characteristics of said amplification device.

22. An apparatus according to claim 21, wherein said amplification device contains an active module, and wherein said modulation device contains a component for triggering said active module.

23. An apparatus according to claim 14, wherein for a multi-cylinder internal combustion engine, said pressure sensor is disposed at a location at which it detects a fresh air stream that is supplied to all cylinders.

24. An apparatus according to claim 14, wherein said internal

combustion engine has an intake manifold that is provided with a hole, wherein said pressure sensor is provided with an input window, and wherein said pressure sensor is mounted on said intake manifold such that said input window is adjacent to said hole of said intake manifold.



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Method and Apparatus for Producing Sounds That Depend on the  
Operation of an Internal Combustion Engine in the Interior Space of a  
Motor Vehicle

The present invention relates to a method and an apparatus for  
producing sounds corresponding to the operation of an internal  
combustion engine in the interior space of a motor vehicle.

Ever increasing limits for external vehicle noise, increasing  
demand for luxury for vehicle occupants, and technological progress have  
led to a situation in modern motor vehicles, especially passenger cars, in  
which engine noise and other acoustic indicators of driving status, such  
as velocity, acceleration, etc., are now nearly inaudible. The undesired  
by-product of the positive results of this reduction in interior noise is that  
the subjective perception of speed and/or acceleration are distorted for  
the vehicle occupants, especially for the driver. This distorted perception  
can lead to faulty assessments of risk, which can have safety  
implications.

The object of the present invention is to solve this problem and to  
provide the driver a realistic subjective perception of the current driving  
conditions, even in very luxurious vehicles having excellent noise  
suppression.

The method in accordance with claim 1 realizes the object of the  
invention.

Claim 2 relates to an apparatus for realizing the object of the

invention.

The apparatus in accordance with the invention is advantageously further developed with the features in claims 3 through 12.

Surprisingly, it has been determined that making audible fluctuations in pressure in the fresh air stream or fresh air charge stream forwarded to the engine imparts to the driver acoustic information about speed, load, and torque, that is, about the operating conditions of the engine, which determine the driving condition of the vehicle.

Another advantage obtained with the invention is that using the method in accordance with the invention, or the apparatus in accordance with the invention, in the interior space produces a sound that is perceived as pleasant.

Converting fluctuations in pressure in the fresh air stream into acoustic signals is extremely simple and requires neither highly complicated multisensors nor complex signal processes.

The invention is explained in more detail in the following with respect to schematic drawings, in which:

- Fig. 1 is a schematic of the intake system of a four-cylinder internal combustion engine;
- Fig. 2 is Section II from Fig. 1;
- Fig. 3 is Section III from Fig. 2;
- Fig. 4 is a block diagram of the apparatus in accordance with the invention; and,

Fig. 5 is a detail of a block diagram that has been modified with respect to Fig. 4.

In accordance with Fig. 1, an internal combustion engine 6 has four cylinders 8 to which fresh air or fresh air charge is supplied via individual intake pipes 10. The individual intake pipes 10 are interconnected via a distributor pipe 12 that is attached via an intake manifold 14 to an air filter 16. Provided for controlling output is a throttle or butterfly valve 18 that a diesel motor lacks and for which another type of output control member can be substituted. An air collector 19 can be interposed between the throttle valve 18 and the air filter 16.

Arranged advantageously upstream of the throttle valve 18 on the air collector 19 or between the air collector and the air filter 16 is a pressure sensor 20 that detects the fluctuations in pressure of the fresh air stream or fresh air charge supplied to the cylinders 8.

Fig. 2 illustrates an enlarged section of Fig. 1.

In accordance with Fig. 2, in its wall the intake manifold 14 has a hole 22 that is aligned with a pressure-sensitive input window 24 of the pressure sensor 20. The pressure sensor 20 is affixed to the intake manifold 14 in a manner known per se, for example with screws or adhesive, whereby the input window 24 advantageously is directly adjacent to the hole 22. Arranged in the interior of the pressure sensor 20 is a pressure-sensitive component 26, for example a piezo element, that is connected via electronics 28 to outputs 29.

The pressure sensor 20 detects fluctuations in pressure at the hole 22. The pressure-sensitive component 26 is therefore embodied and arranged such that it reacts to these fluctuations in pressure. It can be embodied as an absolute pressure sensor. Since the absolute pressure in this case is not of essential importance, but rather the issue is detecting fluctuations in pressure, the component 26 is advantageously embodied as a differential pressure sensor that detects the difference between the pressure at its front side, i.e. the pressure in the hole 22, and the pressure at its rear side, whereby the pressure at the rear side is advantageously the ambient air pressure.

Furthermore, the pressure sensor 20 advantageously has a broad frequency range of, for example, 1 Hz to 10 kHz, and is temperature-compensated. Such a pressure sensor is employed, for example, in doors of motor vehicles as sidecrash collision sensors and can be obtained commercially as a product called the Siemens Pressure Satellite for Sidecrash Tests, EBM 16.

The pressure sensor 20 is advantageously highly dynamic, whereby its broad frequency range ensures that steep ascending or descending edges in the stochastic pressure signals can be detected with no problem. The pressure sensor detects almost no structure-borne noise via the connection.

Fig. 3 illustrates an example. The pressure-sensitive component 26 is a piezo element that reacts to changes in the difference in pressure

acting on its ends with changes in the electrical voltage between its ends. The disk-shaped component 26 is received hermetically sealed in an elastomer sheath 30 that at its end that faces the hole 22 is embodied as a thin diaphragm that opposes the fluctuations in pressure with practically no resistance. The sheath 30 together with the component 26 is received in a mount 31 that is affixed to the intake manifold 14. Structure-borne noise is not picked up, at least in the frequency ranges of interest, due to the appropriate embodiment of the sheath 30 and, if necessary, additional parts between that of the manifold wall and the component 26. Furthermore, the connection of the component 26 to the wall of the manifold is such that structure-borne noise causes almost no excitation, in contrast to large surface area excitation due to fluctuations in air pressure.

It is to be understood that it is also possible to have other connections of pressure-sensitive components or to use other pressure-sensitive components, such as diaphragms, pressure-sensitive resistors, etc. When the back side of the component 3 in Fig. 3 is adjacent along its entire surface to the mount, which is then embodied closed, the component 26 is an absolute pressure sensor. Operating characteristics can be influenced depending on the size of the opening on the back side in the mount 31 and the connection to the ambient pressure and/or manifold pressure.

Fig. 4 illustrates a block diagram of the arrangement. Downstream

of the sensor 20 is a filter device 32, which itself is upstream of an amplifier 33, the output of which is connected to a speaker 34.

5 The frequency response of the filter device 32 is determined by a modulation device 36 that can also be used to change the amplification factor of the amplifier 33. Inputs to the modulation device 36 are connected to a sensor 38 for detecting the position of an output control member, a sensor 40 for detecting vehicle speed, a sensor 42 for detecting a switch lever position, and a switch 44. The structures of the filter device 32, the amplifier 33, the modulation device 36, and the sensors 38, 40, and 42 are known per se and will therefore not be explained in greater detail.

The apparatus described functions as follows:

15 The charge stream through the intake manifold 14 fluctuates corresponding to excitation from the engine. The fluctuations in pressure in the stream in the intake manifold 14 are detected by means of the pressure sensor 20 and, due to the high sensitivity and dynamics of the pressure sensor, are converted into output signals that reproduce the fluctuations in the intake or pressure. These fluctuations in pressure contain immediate information about the speed and load under which the engine is running, whereby the load information is extremely dynamic, especially in the arrangement in accordance with Fig. 1 in which the pressure sensor 20 is disposed upstream of the throttle valve 20. The output signal of the pressure sensor 20 is processed in the filter device

32 and amplified in the amplifier 33 and then reproduced by the speaker 34.

Advantageously, the filter device 32 dampens frequencies greater than 300 Hz, which leads to a pleasant sound that is not distorted by interfering overlaid sounds. Hum frequencies below 30 Hz or 30 to 40 Hz are also suppressed so that no subjectively unpleasant noises are produced. Such a filter device is simple and is therefore cost-effective to produce.

In this manner a sound can be produced that corresponds to the operation of the engine and that is subjectively perceived as direct engine noise, even in vehicle interiors that are sound-proofed extremely well and in which wind noise, tread noise, etc., cannot be heard, and can provide the driver information about the driving status of the vehicle or the output of the engine, permitting the driver to come to a realistic assessment thereof.

The frequency response of the filter device 32 can be matched to the vehicle.

It can be useful to link the frequency response of the filter device 32 to the position of the accelerator, the vehicle speed, and/or the gearshift lever of a transmission by means of the modulation device 36. Similarly, the amplification factor of the amplifier 33 can depend on these parameters. For instance, when the gearshift lever is in a sport position, the frequency spectrum can be slightly elevated and the amplification

factor can be increased at greater speeds or when the output control member position increases. Different sound characteristics can be set by means of the switch 44.

For many applications it is advantageous to influence the engine noise transmitted over the speaker 34 not only by increasing and decreasing its frequency portions, but also to actively change them in that the noise characteristics of a six-cylinder engine are produced from the noise characteristics of a four-cylinder engine, for example using frequency multiplication by a factor of 1.5 and shaping the frequency portions.

Fig. 5 illustrates a modified detail of the block diagram.

In a [sic] with a CVT (continuous variable transmission), there is an effect that the driver is not accustomed to and that is disadvantageous in terms of assessing the current driving speed in that the engine speed is largely independent of driving speed. In the embodiment in Fig. 5, the modulation device 36 contains a storage means for performance characteristic in which a speed characteristic is stored in which the current engine speed corresponding to a conventional drive train, provided for example with a graduated automatic transmission, is stored depending on the position of the accelerator and the vehicle speed. The actual speed is detected by a speed sensor 46 so that any frequency multiplication factor can be calculated that is forwarded to an active module 48. In this manner the engine noise of a CVT vehicle that can be



perceived in the interior space can be adapted to that of a conventional vehicle.

Information about engine operation that is important to the driver can be imparted in a cost-effective manner using the present invention (mass-produced components can be employed). The intake fluctuation contains information about speed and torque that is highly dynamic, especially when detected upstream of a throttle valve, since, for example when idling or when the vehicle is rolling or being pushed, the throttle valve smooths the dynamics in the distributor 12 so that there are only minor fluctuations in the intake manifold 14, which fluctuations increase sharply as the throttle opens more and more.

The apparatus described can be modified in numerous ways. Very different, highly dynamic pressure sensors can be employed. The pressure sensor can be arranged immediately inside the intake manifold, at the air collector 19, or somewhere else such that it detects fluctuations in intake pressure. It is also possible to arrange the pressure sensor upstream of the air filter 16. The apparatus described can be integrated into the sound system in a motor vehicle, whereby modern radio equipment already contains amplifiers that automatically adapt the amplification factor to vehicle speed.

## Claims

1. Method for producing sounds that depend upon the operation of an internal combustion engine in the interior space of a motor vehicle, characterized in that

5           fluctuations in pressure in the fresh air stream supplied to said engine are detected and converted to signals that are made audible via at least one speaker arranged in said interior space.

2. Apparatus for producing sounds that depend upon the operation of a combustion engine in the interior space of a motor vehicle, characterized by

10           a pressure sensor (20) that detects fluctuations in pressure of a fresh air stream in the engine (6);

          an amplification device (30, 32) for amplifying the output signals of the pressure sensor; and

15           at least one speaker (34) connected to said amplifier and arranged in said interior space of said vehicle for reproducing the amplified output signals.

3. Apparatus in accordance with claim 2, characterized in that said pressure sensor (20) is a differential pressure sensor.

20           4. Apparatus in accordance with claim 2 or 3, characterized in that said pressure sensor (30) is a pressure sensor that is sensitive for a broad frequency range.

5. Apparatus in accordance with claim 4, characterized in that the

range of sensitivity of the pressure sensor extends from 1 Hz to 10 kHz.

5 6. Apparatus in accordance with any of claims 2 through 5, characterized in that the amplification device (32, 33, 48) contains a filter device (32) for frequency-selective processing of the output signals of said pressure sensor (20).

7. Apparatus in accordance with claim 6, characterized in that said filter device (32) dampens frequencies over 300 Hz.

8. Apparatus in accordance with claim 6 or 7, characterized in that said filter device (32) dampens frequencies below 30 Hz.

10 9. Apparatus in accordance with any of claims 2 through 8, characterized in that a modulation device (36, 37) is provided with which the properties of said amplification device (32, 33, 48) can be changed.

15 10. Apparatus in accordance with claim 9, characterized in that said modulation device (36, 37) contains a component (37) for triggering an active module (48) in said amplification device (32, 33, 48).

11. Apparatus in accordance with any of claims 2 through 10, characterized in that said pressure sensor (20) is arranged at a position in a multi-cylinder internal combustion engine at which it detects the fresh air stream forwarded to all cylinders.

20 12. Apparatus in accordance with any of claims 2 through 11, characterized in that an intake manifold (14) of the internal combustion engine (6) has a hole (22) and said pressure sensor (20) is affixed to said intake manifold such that an input window (24) of the pressure sensor is

adjacent to the hole.

## Abstract

An apparatus for producing sounds corresponding to the operation of an internal combustion engine in the interior space of a motor vehicle is characterized by a pressure sensor (20) that detects fluctuations in pressure in a fresh air stream into the engine, an amplification device (32, 33) for amplifying output signals of the pressure sensor, and at least one speaker (34) attached to the amplifier and arranged in the interior space of the vehicle for reproducing the amplified signals.

(Fig. 4)

09/744096

Bernhard L. Smith

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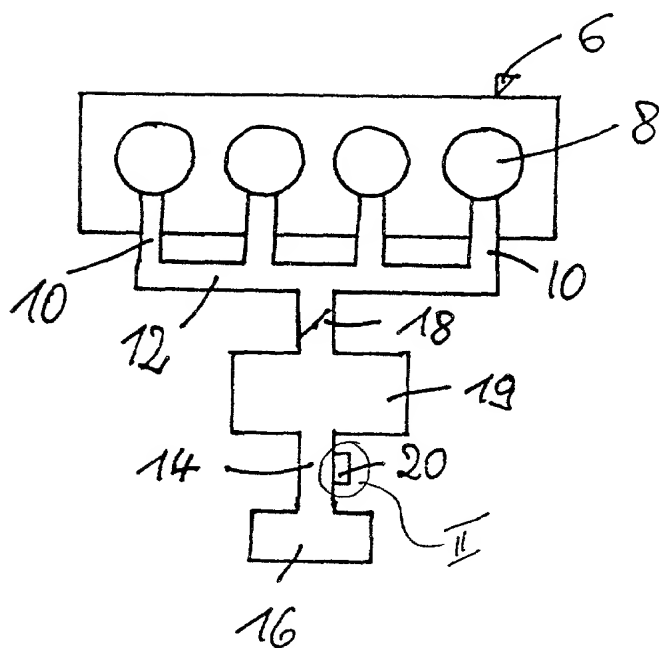


FIG 1

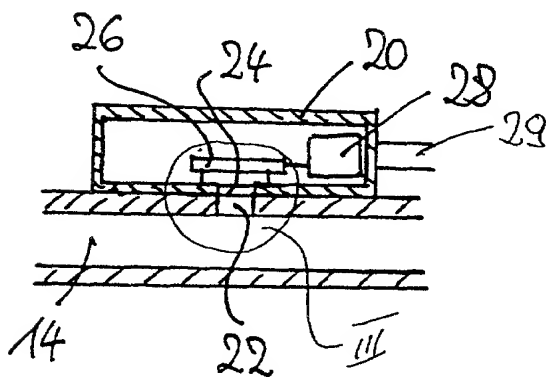


FIG 2

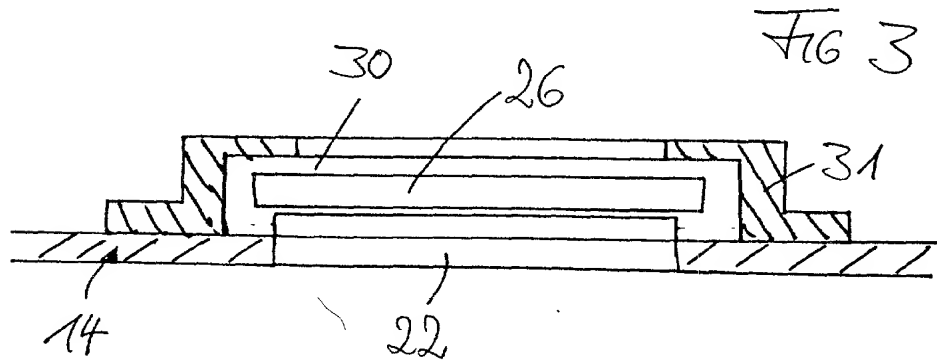


FIG 3

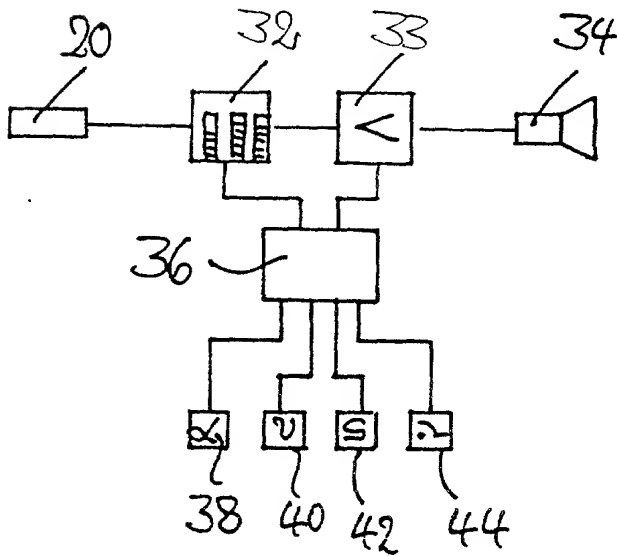


FIG 4

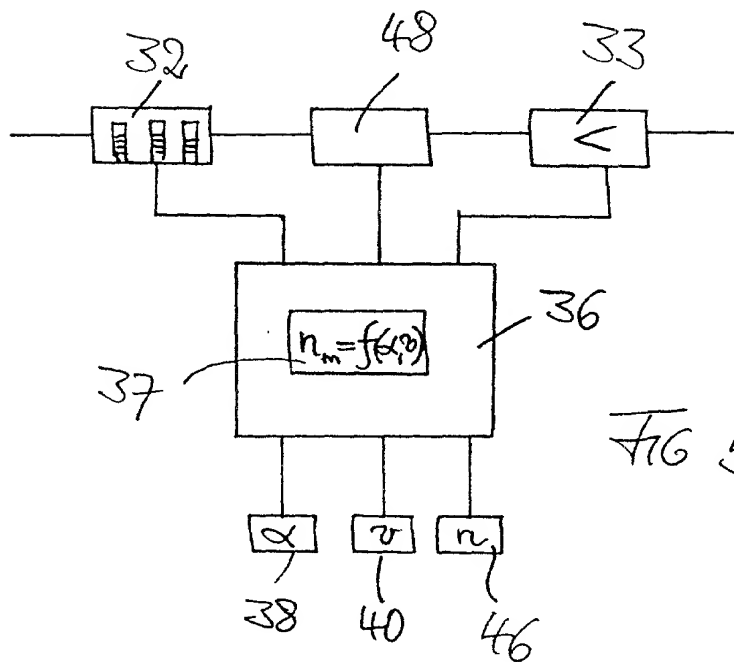


FIG 5



39744076  
5 MAR 2000

Attorney Docket No. 98/07226 WO US  
**COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought of the invention entitled **METHOD AND APPARATUS FOR PRODUCING SOUNDS THAT DEPEND ON THE OPERATION OF AN INTERNAL COMBUSTION ENGINE IN THE INTERIOR SPACE OF A MOTOR VEHICLE** the specification of which

XX was filed on July 13, 1999 as International Application Ser. No. PCT/EP99/04953 and will be amended.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information known by me to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

			Priority Claimed:	
			Yes	No
198 31 576.7 (Number)	Germany (Country)	14 July 1998 (Day/Month/Year Filed)	X	

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

(Application Number)	(Filing Date)
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I hereby appoint attorney Robert W. Becker, Reg. No. 26,255, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. Address all telephone calls to (505) 286-3511. Address all correspondence to **ROBERT W. BECKER & ASSOCIATES, 11896 N. Highway 14, Suite B, Tijeras, New Mexico 87059.**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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